ON THE PHENOLOGY OF THE VELD AROUND JOHANNESBURG.

I. *MONOCOTYLEDONS.*

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Apart from some dated field observations on the veld north of Johannesburg about half a century ago (Rand, 1903), which give an indication of the flowering seasons, Glover's paper (Glover, 1937) remains the only attempt to correlate the behaviour of Witwatersrand plants with the seasons. Glover was principally concerned with the grassland habitat as developed on the Older Granites to the north of the City proper at Frankenwald. It is not out of place therefore to endeavour to extend his observations to deal more comprehensively with the whole flora of the City area. This paper attempts an analysis of the Monocotyledons in which at least one species of the majority of the recorded genera is dealt with.

CLIMATE.

Table 1 gives a summary of the City's climate. A summer of 4 months, a spring and autumn of 3 months each and a winter of 2 months is experienced. Frost has at one time or another been recorded over the 8 months period of March to October although it is only of unexceptional occurrence in winter. Apart from frost the period of greatest difficulty for plants is spring when, before the rains break, a period of rising temperatures with low vapour pressure is experienced. Relative humidities of as low as 18% with an ambient temperature of 25°C. have been recorded at this time. The topography is such that even in the most severe frosts of winter some natural north facing sites and many similar garden corners remain frost free, while streamsides and vleis (marshes) provide habitats where the severity of the spring drought is mitigated.

FLOWERING GROUPS.

Within this climatic framework the following groups of Monocotyledons may be distinguished. The symbols used are:—*a.* annual; *w.* water plant; *g.* grass, usually hemi-cryptophyte; *z.* geophyte; *x.* hysteranthous.

FLOWERING IN WINTER.

Aloe davyana (June—Aug.)
,, mutabilis (July—Sept.)
Hordeum murinum (May—Oct.) a.g.

TABLE I. TABULAR SUMMARY OF JOHANNESBURG'S CLIMATE.

MONTH	Nov., Dec., Jan., Feb.	March, April, May.	June, July	Aug., Sept., Oct.
SEASON	Summer	Autumn	Winter	Spring
RAIN (as a percentage of annual total)	Each month 15%	Rain decreases to 4% in May.	Each month <1%	Rain uncertain—up to 7½% in Oct.
FROST	None	May occur in late April.	Frequent	Occasional
TEMPERATURE (mean monthly max.)	25°C.	Falling to <20°C.	<17°C.	Rising to <25°C. in Oct.
TEMPERATURE (mean monthly min.)	14°C.	Falling to <6°C.	<4°C.	Rising to <9°C. in Oct.
SUNSHINE (percentage of possible daily)	~70%	~75%	~80%	~75%
ACTUAL VAPOUR PRESSURE (at warmest time of day)	15 mbs.	11 mbs.	7 mbs.	9 mbs.

The *Hordeum* is adventive and has persisted on one or two sites as a winter weed. The *Aloes* are truly frost resistant.

SPRING. I. THE PRE-RAINS FLORA. Aug.-Sept.

Stiburus conrathii *g.*
Rendlia nelsoni *g.*
Juncus subglobosus *a. w.*
Bulbine stenophylla *z.*
Urginea multisetosa *x. z.*
Scilla ovatifolia *x. z.*
,, marginata *z.*
Litanthus pusillus *x. z.*
Chortolirion subspicatum *x. z.*
Hesperantha longicollis *x. z.*
Eulophia hians *x. z.*
Bonatea sp. *x .z.*
Moraea mossii *x. z.*
Homeria pura *z. w.*

Juncus subglobosus is an annual which apparently is not tolerant of the later summer heat. The two grasses *Stiburus* and *Rendlia* have only recently been recognised as important constituents of the local veld flora due to their early flowering period. The remainder are all geophytes and half of them more or less hysteranthous.

SPRING. II. THE SPRING FLORA PROPER. Sept.—Nov.

Briza minor *g.*
Festuca caprina *g.*
Koeleria capensis *g.*
Brachiaria filifolia *g.*
Eleocharis palustris *w. z.*
Bulbostylis collina *z.*
,, schoenoides *z.*
Schoenoxiphium caricoides *z.*
Carex glomerabilis *z.*
,, drakensbergensis *z.*
Bulbine narcissifolia *z.*
Androcymbium striatum *z.*
Ornithogalum leptophyllum *x. z.*
Albuca pachychlamys (*x.*) *z.*
Urginea depressa *x. z.*
,, rubella *x. z.*
Drimiopsis minor *z.*
Scilla neglecta *z.*
,, saturata *z.*
,, minima *x. z.*
Dipcadi oligotrichum *z.*
Anoiganthus breviflorus *z.*
Haemanthus magnificus *z.*
Böophone disticha *z. x.*
Vellozia retinervis.
Gynandriris mossii *x. z.*(i)
Lissochilus platypetalus *x. z.*
Holothrix sp. *x. z.*

Again hysteranthy is a feature of some species. In *Albuca pachychlamys* there are many forms some hysteranthous, others not.

SUMMER FLOWERING. Nov.—Feb.

Alisma plantago *w.*
Aponogeton spathaceum *w. g.*
Fimbristylis monostachya *z.*
Ascolepis capensis *z.*

(i) Helixyra mossii N.E.Br.

Helictotrichum turgidulum *g.*
Harpechloa falx *g.*
Brachiaria serrata *g.*
Imperata cylindrica *g.*
Heteropogon contortus *g.*
Eleonurus argenteus *g.*
Eragrostis gummiflua *g.*
,, curvula *g.*
Eragroscis racemosa *g.*
,, brizoides *g.*
Triraphis andropogonoides *g.*
Leersia hexandra *w. g.*
Arundinella ecklonii *g.*
Tristachya hispida *g.*
.. rehmannii *g.*
Loudetia simplex *g.*
Sporobolus pyramidalis *g.*
,, stapfianus *g.*
.. centrifugus *g.*
Aristida junciformis *g.*
Tragus berteronianus *g.*
.. koelerioides *g.*
Microchloa caffra *g.*
Lophacme digitata *g.*
Eustachys paspaloides *g.*
Brachiaria nigropedata *g.*
Digitaria tricholaenoides *g.*
Pennisetum thunbergii *g.*
Andropogon appendiculatus *g.*
.. huillensis *g.*
.. eucomus *g.*
Miscanthidium junceum *g.*
Urelytrum squarrosum *g.*
Haemarthria altissima *g.*
Scirpus burkei *z.*
Fuirena pubescens *z.*
Pycreus lanceus *z.*
Coleochloa rehmannii *z.*
Ficinia tristachya *z.*
Kyllinga alba *z.*
Cyperus obtusiflorus *z.*
,, denudatus *z.*
Mariscus marlothii *z.*
Pycreus macranthus *z.*
Scleria buchanani *z.*
Zantedeschia macrocarpa *z.*
Xyris gerrardii *z.*
Cyanotis speciosa *z.*
Anthericum nataglencoense *z.*
Bulbine trichophylla *z.*
Eriospermum hygrophilum *z.*
,, burchellii *z.*
Asparagus cooperi.
Ornithogalum pretoriense *z.*
Tulbaghia alliacea *z.*
Albuca shawii *z.*
Aloe verecunda *z.*
Schizobasis intricata *z.*
Eucomis undulata *z.*
Kniphofia ensifolia *z.*
Dipcadi palustre *z.*
Drimia ciliaris *z.*
Sansevieria zeylanica *z.*
Agapanthus weilligii *z.*
Crinum bulbispermum *z.*
,, graminicolum *z.*
Haemanthus montanus *z.*
Hypoxis filiformis *z.*
Dioscorea sylvatica *z.*
Gladiolus woodii *z.*
,, cooperi *z.*
,, crassifolius *z.*
Tritonia petrophila *z.*
Aristea woodii *z.*
Lapeyrousia laxa *z.*
Eulophia zeyheri *z.*
,, bakeri *z.*
Satyrium ocellatum *z.*

Quite a number of these have a relatively short flowering period either in the early or later part of the season while the grasses on the whole tend to flower over at least two months.

LATE SUMMER—AUTUMN. Jan.—May.

Typha australis *w.*
Potamogeton octandrus *a.*
Zanichellia pedicillata *w.*
Lagarosiphon muscoides *a.*
Eragrostis namaquensis *a.*
,, plana *g.*
Diplachne biflora *g.*
,, fusca *g.*
Pogonarthria squarrosa *g.*
Trichoneura grandiglumis *g.*
Phragmites communis *w. g.*
Agrostis eriantha *a.*
Aristida congesta *a.*
,, barbicollis *a.*
Perotis indica *a.*
Eleusine indica *a.*
Chloris virgata *a.*
Lepturella capensis *g.*
Panicum laevifolium *a.*
,, repens *g.*
Paspalum distichum *g.*
,, scrobiculatum *g.*
Echinochloa colona *a.*
,, stagnina *a.*
Urochloa helopus *a.*
Digitaria monodactyla *g.*
Schizachyrium semiberbe *g.*
Cymbopogon excavatus *g.*
,, marginatus *g.*
Hyparrhenia aucta *g.*
Monocymbium ceresiiforme *g.*
Trachypogon plumosus *g.*
Ischaemum purpureum *g.*
Eleocharis atropurpurea *a.*
Lipocarpha pulcherrima *a.*
Fimbristylis complanata *z.*
Cyperus difformis *a.*
Bulbostylis burchellii *z.*
Pycreus pumilus *a.*
Scleria woodii *z.*
Eriocaulon abyssinicum *a.*
Commelina subulata *a.*
Androcymbium subulatum *z.*
Asparagus asparagoides *z.*
Nerine rehmannii *z.*
Schizostylis pauciflora *z.*
Babiana hypogea *z.*
Disperis micrantha *z.*
Habenaria foliosa *z.*
,, tetrapetala *z.*
Bonatea boltoni *z.*

This group gives strong support to General Smuts' contention (Bews, 1925) that with the advancing season the veld takes on a more tropical aspect. The number of annuals is interesting, a few behave as annuals in this climate being killed by the winter frosts. Many of them are much more prominent in seasons when the rains persist into March and April and are to be found in the shallow detritus edging ponds on rock outcrops.

FLOWERING THROUGHOUT THE FROST-FREE MONTHS Aug.—May.

Potamogeton pectinatus *w.*
Rhynchelytrum repens *g.*
,, setifolium *g.*
Themeda triandra *g.*
Scirpus fluitans *w.*
Alloteropsis semialata *g.*
Eleocharis limosa *w.*
Anthericum micranthum *z.*

The Anthericum is found flowering continuously. The others appear to flower sporadically but may be found in flower in any month apart from June and July.

FLOWERING THROUGHOUT THE YEAR.

Bromus carharticus *g.*
Poa annua *a.*
Ehrharta erecta *g.*
Hyparrhenia hirta *g.*
Setaria verticillata *a.*
Scirpus corymbosus *w.*
Agrostis lachnantha *g.*

The Brome and the *Poa* are adventive and commonly associated with human habitation, likewise the *Scirpus* is a plant of the many artificial ponds and lakes. *Agrostis* is a riverine plant and with the *Ehrharta* the *Hyparrhenia* and the *Setaria* manage to survive the winter in protected spots like the Witpoortjie gorge. *Hyparrhenia hirta* is especially of interest for, through the investigations of the genus necessary to his cytological studies, Krupko (1954) has found that the principal flowering period is January to April and that viable seed may be found from February to the time of the first hard frost usually in May. At other times of the year ripe seed is not found.

The list of plants recorded here is not sufficiently complete to attempt a "biological spectrum" but the large number of hemi-cryptophytes and geophytes amongst the Monocotyledons which grow locally are noteworthy. A fuller discussion of life-forms will be presented after the second part dealing with Dicotyledons.*

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C.T. LTD.